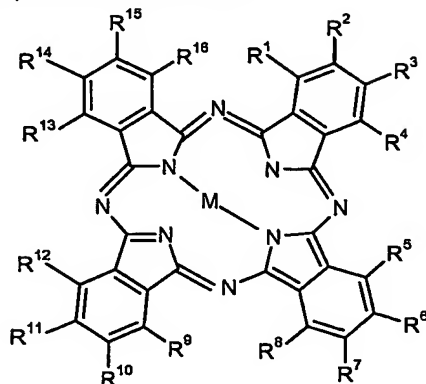


CLAIMS

1. A phthalocyanine compound of Formula I



wherein at least 5 of the groups represented by R¹, R⁴, R⁵, R⁸, R⁹, R¹², R¹³ & R¹⁶ are independently -X-J or -X-L-X¹-, wherein

each J is independently selected from C₁₋₆-alkyl; C₂₋₆-alkenyl; C₄₋₈-cycloalkyl (each being optionally substituted by a group selected from C₁₋₄-alkoxy, C₁₋₄-alkylthio, C₆₋₁₂-aryl, C₆₋₁₂-arylthio, C₁₋₄-alkylsulphonyl, C₁₋₄-alkylsulphonylamino, C₁₋₄-alkylsulphoxide, amino, mono- and di-C₁₋₄-alkylamino, halogen, nitro, cyano and hydroxycarbonyl (-COOH), hydroxysulphonyl (-SO₃H) or dihydroxyphosphonyl (-PO₃H₂) or C₁₋₄-alkyl esters thereof) and from C₆₋₁₂-aryl (optionally substituted by a group selected from C₁₋₃-alkyl, C₁₋₃-alkoxy, C₁₋₃-alkylthio, C₁₋₃-alkylsulphonyl, C₁₋₃-alkylsulphonylamino, C₁₋₄-alkylsulphoxide, amino, mono- and di-C₁₋₃-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxysulphonyl or dihydroxyphosphonyl, hydroxycarbonyl-C₁₋₃-alkyl, hydroxysulphonyl-C₁₋₃-alkyl, dihydroxyphosphonyl-C₁₋₃-alkyl or C₁₋₃-alkyl esters thereof);

each L is independently selected from C₁₋₆-alkylene and C₄₋₈-cycloalkylene (each being optionally substituted by a group selected from C₁₋₄-alkoxy, C₁₋₄-alkylthio, C₆₋₁₂-aryl, C₆₋₁₂-arylthio, C₁₋₄-alkylsulphonyl, C₁₋₄-alkylsulphonylamino, C₁₋₄-alkylsulphoxide, amino, mono- and di-C₁₋₄-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxysulphonyl or dihydroxyphosphonyl or C₁₋₄-alkyl esters thereof); and from C₆₋₁₂-arylene (optionally substituted by a group selected from C₁₋₃-alkyl, C₁₋₃-alkoxy, C₁₋₃-alkylthio, C₁₋₃-alkylsulphonyl, C₁₋₃-alkylsulphonylamino, C₁₋₃-alkylsulphoxide, amino, mono- and di-C₁₋₃-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxysulphonyl, dihydroxyphosphonyl, hydroxycarbonyl-C₁₋₃-alkyl, hydroxysulphonyl-C₁₋₃-alkyl or dihydroxyphosphonyl-C₁₋₃-alkyl or C₁₋₃-alkyl esters thereof);

M is an oxymetal group;

each X independently is S, Se, Te or NT;

each X¹ independently is S, Se, Te or NT and directly attached to a peripheral 3,6-carbon atom of another phthalocyanine compound of Formula I;

each T independently is H, alkyl or phenyl, or T & J, together with the N atom to which they are attached, form an aliphatic or aromatic ring provided this N atom is not positively charged; provided where J is aryl, T is not aryl;

and the remaining groups from R¹ to R¹⁶ are independently selected from H, halogen, -OJ, hydroxycarbonyl, hydroxysulphonyl, dihydroxyphosphonyl, hydroxycarbonyl-C₁₋₃-alkyl, hydroxysulphonyl-C₁₋₃-alkyl and dihydroxyphosphonyl-C₁₋₃-alkyl, provided that at least one of R² and R³, at least one of R⁶ and R⁷, at least one of R¹⁰ and R¹¹ and at least one of R¹⁴ and R¹⁵ is hydrogen, with the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

2. A phthalocyanine compound according to Claim 1 wherein all eight of R¹, R⁴, R⁵, R⁸, R⁹, R¹², R¹³ & R¹⁶ comprise a group of the formula -X-J or -X-L-X¹-, preferably -X-J.

3. A phthalocyanine compound according to Claim 1 or 2 wherein each of R², R³, R⁶, R⁷, R¹⁰, R¹¹, R¹⁴ & R¹⁵ is H.

4. A phthalocyanine compound according to any one preceding Claim wherein the compound has an electronic absorption peak from 750 to 1100 nm, more preferably from 800 to 1000 nm.

5. A phthalocyanine compound according to Claim 4 wherein the compound has at least 90%, preferably at least 95%, of its absorption strength in the region above 400nm at or above 750 nm.

6. A phthalocyanine compound according to Claim 4 or 5 wherein the electronic absorption peak has a band width at half peak height in solution of less than 60 nm.

7. A phthalocyanine compound according to any one preceding Claim wherein J is selected from C₃₋₆-alkyl, which may be straight or branched chain; C₂₋₄-alkenyl; cyclohexyl; phenyl; naphtha-1-yl or naphtha-2-yl, each of which is optionally substituted as defined in claim 1.

8. A phthalocyanine compound according to Claim 7 wherein J is phenyl, optionally substituted as defined in claim 1.

9. A phthalocyanine compound according to Claim 7 or 8 wherein the substituent(s) for the phenyl; naphtha-1-yl or naphtha-2-yl groups represented by J is(are) independently

selected from C₁₋₂-alkyl; C₁₋₂-alkoxy; C₁₋₂-alkylthio; C₁₋₂-alkylsulphonyl; C₁₋₂-alkylsulphoxide; amino; mono- and di-C₁₋₂-alkylamino; halogen; nitro; cyano; hydroxycarbonyl, hydroxysulphonyl, dihydroxy-phosphonyl, hydroxycarbonyl-C₁₋₃-alkyl, hydroxysulphonyl-C₁₋₃-alkyl and dihydroxy-phosphonyl-C₁₋₃-alkyl and C₁₋₂-alkyl esters thereof.

10. A phthalocyanine compound according to any one of claims 7 to 9 wherein the optionally substituted phenyl; naphtha-1-yl or naphtha-2-yl groups represented by J are selected from phenyl, 4-methylphenyl, 2-methylphenyl, 4-i-propylphenyl, 2,4-dimethylphenyl, 2,5-dimethylphenyl, 3,5-dimethylphenyl, 4-methoxyphenyl, 4-methylthiophenyl, 3-(2-[methoxycarbonyl]ethyl)phenyl, 3-(hydroxycarbonyl)phenyl, 4-(hydroxysulphonyl)-phenyl, 2-chlorophenyl, 4-bromophenyl, 3,5-dichlorophenyl, naphtha-1-yl and naphtha-2-yl.

11. A phthalocyanine compound according to any one of the preceding claims wherein the groups R¹, R⁴, R⁵, R⁸, R⁹, R¹², R¹³ & R¹⁶ are identical.

12. A phthalocyanine compound according to any one of the preceding claims wherein the compound has a formula:



wherein

M is an oxymetal group selected from VO, TiO and MoO;

Pc is the phthalocyanine nucleus;

each X is independently S, Se, Te or NT wherein T is H, C₁₋₄-alkyl or phenyl; and

each R is independently phenyl or naphthyl each of which is optionally substituted by up to 5 groups selected from C₁₋₃-alkyl, C₁₋₃-alkoxy, C₁₋₃-alkylthio, C₁₋₃-alkylsulphonyl, C₁₋₃-alkylsulphonyl-amino, C₁₋₃-alkylsulphoxide, amino, mono- and di-C₁₋₃-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxy-sulphonyl, dihydroxyphosphonyl, hydroxycarbonyl-C₁₋₃-alkyl, hydroxysulphonyl-C₁₋₃-alkyl or hydroxyphosphonyl-C₁₋₃-alkyl or C₁₋₃-alkyl esters thereof; or

R & T together form a piperidiny, piperaziny, morpholiny or pyrroliny ring.

13. A phthalocyanine compound according to any one of the preceding claims wherein X and/or X¹ is sulphur.

13 A phthalocyanine compound according to any one preceding Claim wherein each of R¹, R⁴, R⁵, R⁸, R⁹, R¹², R¹³ & R¹⁶ is 4-methylphenylthio and each of R², R³, R⁶, R⁷, R¹⁰, R¹¹, R¹⁴ & R¹⁵ is H.

14 A phthalocyanine compound according to any one preceding Claim wherein M is VO.

15 A method for the production of a lithographic printing plate containing a photosensitive layer comprising irradiating the photosensitive layer with an infra-red laser in accordance with pattern information wherein the photosensitive layer comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

16 A method of polymer welding in which a polymer material is irradiated with infra-red laser in a region where it is desired to form a weld wherein the polymer material comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc, or wherein the polymer material is coated or printed with the compound where it is desired to form a weld, or wherein the compound is provided in a layer or film which is located adjacent the polymer material where it is desired to form a weld.

17 A method for the protection of an interior of a glazed structure against the heating effect of incident IR radiation by incorporating into the glazing or a layer forming part of the glazing a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

18. A method for the attenuation of IR irradiation passing through a protective film by incorporating into the protective film or a layer forming part of the protective film an compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

19 A method for detecting an article carrying a superficial image by scanning with an infra-red detector wherein the image comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

20 A method for the formation of a permanent toner image on a substrate using an electrophotographic device incorporating an IR source to fix the temporary toner image on the substrate and/or provide an IR-readable permanent toner image wherein the toner comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

21. An article carrying an image adapted for machine reading in response to a reflective signal generated by scanning the image with infra-red radiation wherein the image comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

22. A method for the enhancement of a thermal signal comprising incorporating into or onto the article from which the thermal signal is derived a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

23. An ink comprising a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

24. An ink according to Claim 23 also comprising a colorant.

25. An ink according to Claim 23 or Claim 24 also comprising an alkoxyated or polyalkoxyated acrylate monomer and a photoinitiator.

26. Use of compounds of formula I in claim 1 but without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc as a security marker.

27. A method of establishing the authenticity of an article or substrate comprising marking the article or substrate with a mark including a compound according to formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc and detecting and/or measuring a characteristic absorption of infrared radiation by the mark.